IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of

Minoru ASOGAWA et al.

Appeal No._____

Application No. 10/536,908

Group 2881

Filed May 27, 2005

Examiner B. Souw

SEPARATION APPARATUS, METHOD OF SEPARATION, AND MASS SPECTROMETRY SYSTEM

APPEAL BRIEF

MAY IT PLEASE YOUR HONORS:

1. Real Party in Interest

The real party in interest in this appeal is the Assignee, NEC Corporation of Tokyo, Japan.

2. Related Appeals and Interferences

None.

3. Status of the Claims

Claims 1-7, 10-12, 16, 21-26, 30, 31 and 34-39 are pending. Claims 8, 9, 13-15, 17-20, 27-29, 32 and 33 were previously canceled. The present appeal is taken from the final rejection of claims 1-4, 16, 21-26, 30, 31, 34, 35, 38 and 39. Claims 5-7, 10, 36 and 37 are indicated as allowed, and claims 11 and 12 are indicated as allowable.

4. Status of Amendments

An amendment after final rejection filed on February 6, 2008 to correct an objection to the abstract was entered.

5. Summary of Claimed Subject Matter

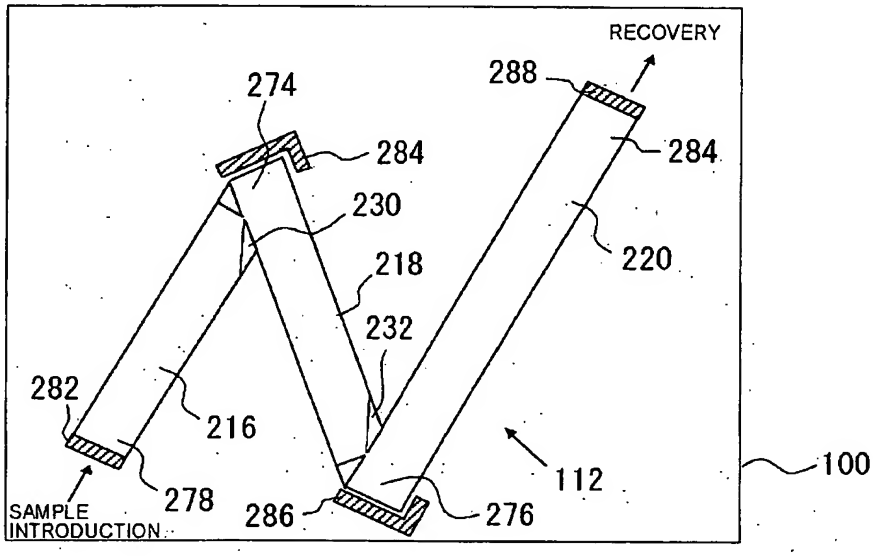
With reference to page 1, lines 7-10 of the specification, the invention relates to a separation apparatus, a method of separation, and a mass spectrometry apparatus, used for separating a specific component from a plurality of components contained in a sample.

The independent claims are claims 1, 5, 16 and 21.

As recited in claim 1 and illustrated by way of example in Figure 5, reproduced below, a separation apparatus 100 comprises a channel 112 through which a sample containing components-to-be-separated moves. See page 2, lines 23-24. Apparatus 100 also includes one, or two or more check valves 230, 232 disposed in said channel 112, suppressing back flow of said components-to-be-separated. See page 2, lines 24-26. See also Figure 1 and page 4, line 14 to page 5, line 10. The apparatus 100 further includes a plurality of compartments 216, 218, 220 partitioned by said check valve(s). See page 2, lines 26-27. The apparatus still further includes an external force imposing unit 282, 286, 288 imposing external force to said components-to-be-separated so as to allow them to move through said channel. See page 2, line 27 to page 3, line 2. The external force imposing unit 282, 286, 288 has a function of alternately

executing a first external force imposing pattern by which the external force is imposed to said components-to-be-separated in the forward direction along said channel, and a second external force imposing pattern by which the external force is imposed to said components-to-be-separated in the direction opposite to the forward direction along said channel, to thereby fractionate said components-to-be-separated into any of said compartments. See page 3, lines 2-10.

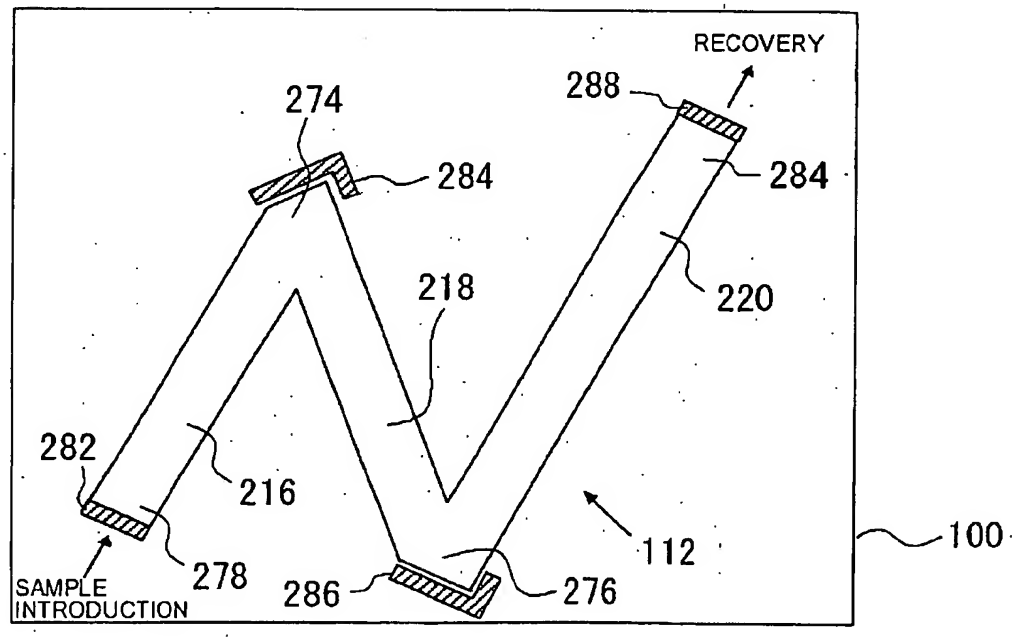
FIG. 5



As recited in claim 5 and illustrated by way of example in Figure 9, reproduced below, a separation apparatus 100 includes a channel 112 through which a sample containing components-to-be-separated moves. See page 2, lines 23-24. The channel has a plurality of compartments partitioned by one, or two or more bent portions 274, 276 of the channel. See page 8, lines 3-5. The apparatus 100 also includes an external force

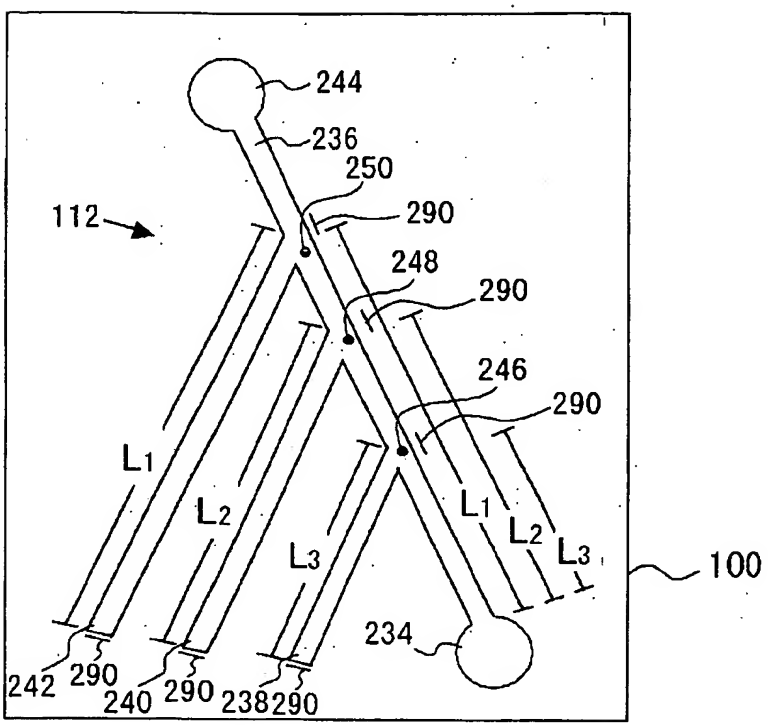
imposing unit 282, 284, 286, 288 imposing a plurality of external force imposing patterns having different imposing directions from each other to said components-to-be-separated so as to allow them to move through said channel. See page 3, lines 3-10. The external force imposing unit has a function of imposing a first external imposing pattern having a certain imposing direction so that a portion of said components-to-be-separated is intercepted by one of said bent portions, and subsequently imposing a second external imposing pattern having a different imposing direction from said certain imposing direction such that said portion of said components-to-be-separated intercepted by said one of said bent portions is moved to the downstream next compartment. See page 8, lines 6-20.

FIG. 9



As recited in claim 16 and illustrated by way of example in Figure 11, reproduced below, a separation apparatus 100 includes a channel 112 having a main channel 236 and sub channels 238, 240, 242 formed as being branched out from said main channel, through which a sample including components-to-be-separated moves. See page 43, lines 10-13. The main channel having one end where a sample introduction port is provided and the other end placed downstream of said one end. See page 43, lines 17-18. The apparatus 100 also includes an external force imposing unit imposing a plurality of external force imposing patterns having different imposing directions from each other to said components-to-be-separated so as to allow them to move through said channel. See page 44, lines 8-13. The external force imposing unit has a function of imposing a first external imposing pattern having a certain imposing direction from said one end to the other end of said main channel so that a portion of said components-to-be-separated is moved to the downstream of the connecting position of said main channel and one of said sub channels in said main channel and subsequently imposing a second external imposing pattern having a different imposing direction from said certain imposing direction so that at least a part of said portion of said components-to-be-separated moved to the downstream of said connecting position is moved into said one of said sub channels. See page 45, line 16 to page 47, line 2.

FIG. 11

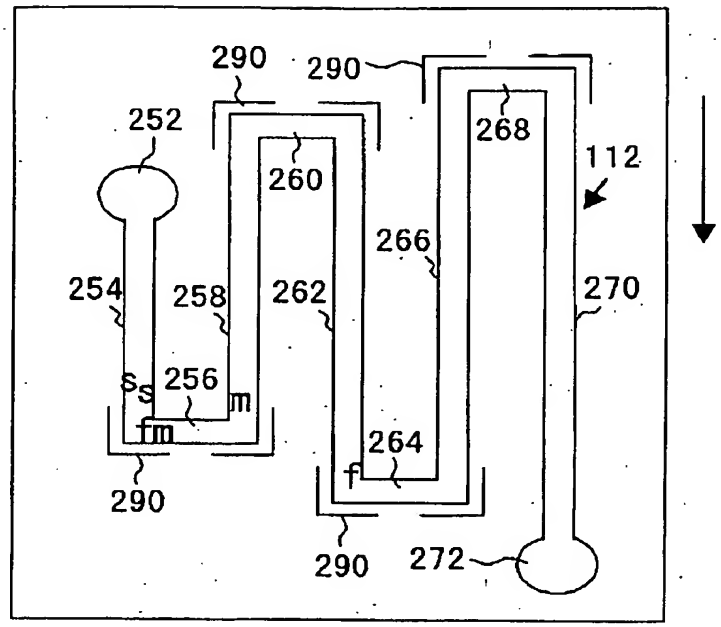


As recited in claim 21 and illustrated by way of example in Figures 17 (a) and (b), reproduced below, a separation method uses a separation apparatus that includes a channel 112 through which a sample containing components-to-be-separated f, m, s moves, a plurality of compartments provided to said channel 254, 258, 262, 266, 270, and an external force imposing unit 290 imposing external force to said components-to-be-separated so as to allow them to move through said channel. See page 16, lines 12-18. For the method, the external force is repetitively imposed sequentially in the direction departing from a sample introduction position and in the direction approaching the position on said channel, to thereby fractionate said components-

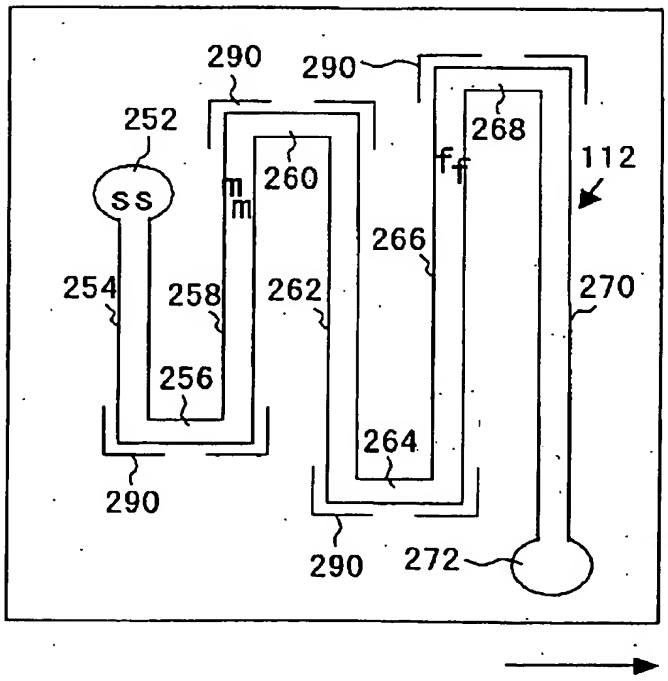
to-be-separated into any of said compartments. See page 16, lines 18-22.

FIG. 17

(a)



(b)



6. Grounds of Rejection to be Reviewed on Appeal

1) Whether claims 21, 22 and 34 would have been obvious, in the meaning of 35 USC §103(a) based on CARLE et al. 5,167,790 in view of CHAN et al. 6,696,022.

2) Whether claims 16, 30 and 31 would have been obvious, in the meaning of 35 USC §103(a) based on CARLE et al. in view of CHAN et al. and further in view of SHIMOIDE et al. 7,105,354.

3) Whether claims 1-4, 23-26, 38 and 39 would have been obvious, in the meaning of 35 USC §103(a) based on CARLE et al. in view of CHAN et al. and further in view of ANDERSON et al. U.S. Publication No. 2001/00366720 and PETHIG et al. WO-97/34689.

4) Whether claim 35 would have been obvious, in the meaning of 35 USC §103(a) based on CARLE et al. in view of CHAN et al. and ANDERSON et al. and PETHIG et al. and further in view of HANCOCK et al. 5,716,825.

7. Arguments

Arguments in Favor of the Patentability of
Claims 21, 22 and 34 in View of CARLE and CHAN

The Final Rejection recognizes that CARLE does not disclose a compartment consistent with how one of ordinary skill in the art would reasonably construe this term since the lanes of CARLE are not enclosed. Nevertheless, the Final Rejection argues (page 5, first two paragraphs) that it would have been obvious to

modify the open "compartments" of CARLE to use true partitions, or compartments or channels because such "true" compartments are known as taught by CHAN and that having compartments in CARLE would allow high resolution of separation, in order to achieve high throughput of sample separation.

However, this position is believed to be clearly untenable for at least the following reasons.

First, the proposed modification of CARLE would change the principle of operation of CARLE.

Element 16 of CARLE, offered in the Final Rejection as a compartment, is disclosed on column 8, lines 34-37 as being a gel layer or slab having a series of sample wells 17 cast into the gel at one end. Gel layer 16 is shown supported by tray 28 in Figure 2 of CARLE, reproduced below. CARLE is characterized by a uniform gel layer and the absence of physical walls between sample wells 17.

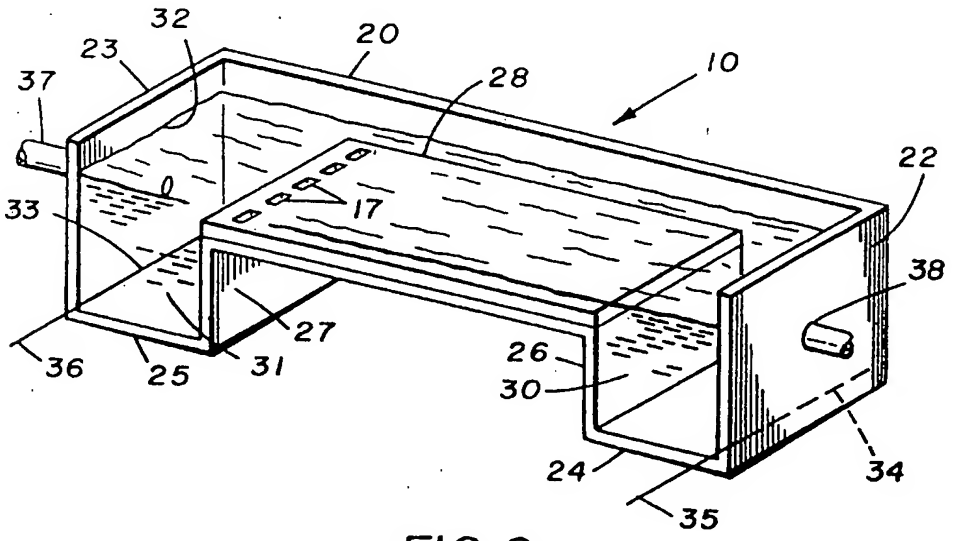


FIG. 2.

Having physical walls separating the wells of CARLE from each other would change the principle of operation of CARLE and not enable CARLE to use the gel layer for its intended purpose of obtaining an accurate comparison of substances across the layer. See column 6, lines 50-67.

Second, the references teach away from their combination.

CARLE teaches away from conventional electrophoresis and rather disclose in the abstract lines 1-8, a method and apparatus for gel electrophoresis which employs periodic inversion of the electric field essentially in one dimension, denoted as field inversion gel electrophoresis (FIGE), results in net migration by using a longer time or higher voltage in one direction than in the opposite direction. FlGE permits separation of DNA or protein mixtures in size ranges not accessible to ordinary electrophoresis.

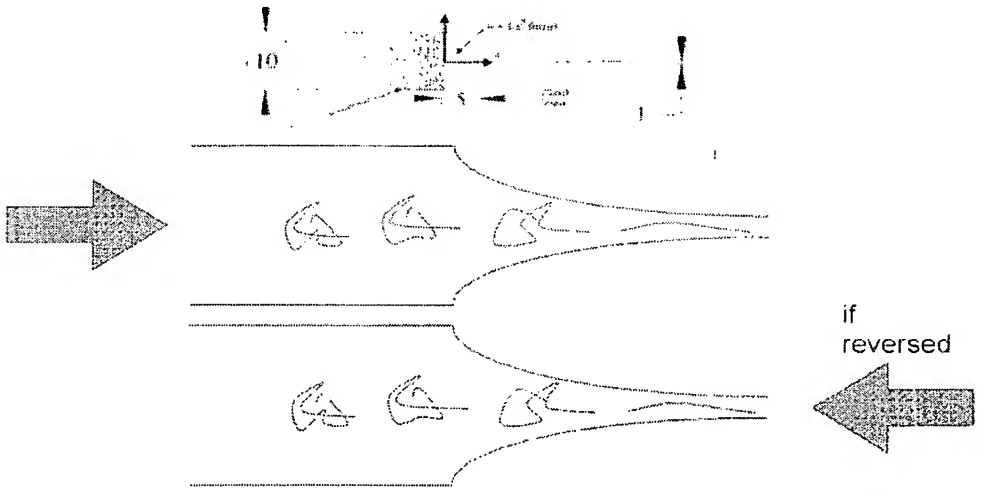
In addition, column 4, lines 14-24 of CARLE disclose that "The successful results achieved with the field-inversion gel electrophoresis system of this invention were surprising and unexpected in view of prior experience with electrophoresis." and "They were also not predictable from existing molecular theories." Thus, there would be no motivation to combine CARLE with the conventional (ordinary) electrophoresis of CHAN.

Further, column 4, line 64 to column 5, line 21 of CHAN disclose the disadvantages of using alternating currents to separate DNA. CARLE uses alternating currents.

In addition, the object of CHAN is to stretch the molecules. If the molecules are subject to electric fields in both forward and reverse directions, movement in the forward direction would tend to stretch the molecules from their original entangled shape, while movement in the reverse direction would return the molecules to their original shape. See exemplary Figure 1, reproduced below.

Fig.1

As for Chan



Such a phenomenon goes against the teachings of CHAN and thus, one of ordinary skill in the art would not be motivated to combine CHAN and CARLE.

As the references each teach away from a combination with the other, it would not have been obvious to make the proposed combination.

Third, even if one were to consider the references in the first instance, the proposed combination of references would result in an inoperative device.

The Examiner picked from the secondary reference of CHAN the compartments having walls to partition the channel 16 of CARLE, but ignored that the walls of CHAN are used to perform stretching by applying a shear force as the polymer passes through the structures, placing obstacles in the path of the polymer, or a combination thereof. See the abstract, lines 1-10 of CHAN. The creation of shear force and/or obstacles in the path is necessary for the stretching to obtain a high throughput screening as taught by CHAN (abstract, lines 10-13). The Examiner cannot ignore the shear force and/or obstacles in the path because they are necessary for the full appreciation of what CHAN fairly teaches and suggests to one of ordinary skill in the art (i.e., stretching by applying shear force and/or having obstacles in the path).

Therefore, the Examiner used impermissible hindsight reconstruction by picking the walls of CHAN and excluding the associated shear force and/or obstacles in the path necessary to the full appreciation of stretching to allow high throughput.

Furthermore, the Examiner's articulated reasoning in

the rejection does not possess a rational underpinning to support the legal conclusion of obviousness. ***In re Kahn,*** 441 F.3d 977, 988 (Fed. Cir. 2006). The Examiner articulated as motivation the teaching of walled channels for the purpose of achieving high throughput of sample separation. (final Rejection page 5, 2nd paragraph). However, this motivation does not possess a rational underpinning to support the legal conclusion of obviousness in that the application of shear force and/or the placement of obstacles in the polymer path cannot be separated out from the teaching of separation as a whole, which necessarily includes the shear force and/or obstacles.

Thus, the picking of the channels to the exclusion of the shear force and/or obstacles and the articulated reasoning of increasing throughput of sample separation to combine the references do not support the legal conclusion of obviousness.

Finally, incorporation of walls into the CARLE system would lead to inoperability. "The consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that this process should be carried out and would have a reasonable likelihood of success, viewed in the light of the prior art." *In re Dow Chemical Co.,* 837 F.2d 469, 473 (Fed. Cir. 1988). The modification of CARLE with the teaching of CHAN to incorporate walls that exert a shear force or include obstacles would prevent formation of bands in CARLE thereby leading to inoperability.

That is, the modification of CARLE as proposed would create items that exert an influence on the macromolecules of CARLE and would lead to the inoperability of the CARLE apparatus. See column 1, lines 27-36 of CARLE disclosing the importance of the support not exerting any influence on the macromolecules in the mixture.

In view of the above, the Examiner has not established obviousness because the applied references neither teach nor would have suggested to the skilled artisan the proposed modification of CARLE in view of CHAN due to the resulting inoperability.

Based on the above-noted differences in the prior art, the proposed combination is not only improper, but also would not meet the present claims.

According to features of the recited invention, a specific component can be obtained at a specific place (compartment). This may be achieved based on the shape of the channel (especially the length of the channel) and the period of times in which the power is forced. This is not obvious from combining the invention of CARLE with the invention of CHAN.

In order to make theses differences clearer, appellants provide below an explanation according to the present invention, wherein the sample can be separated even in the case in which the forward moving period and the reverse moving period are the same.

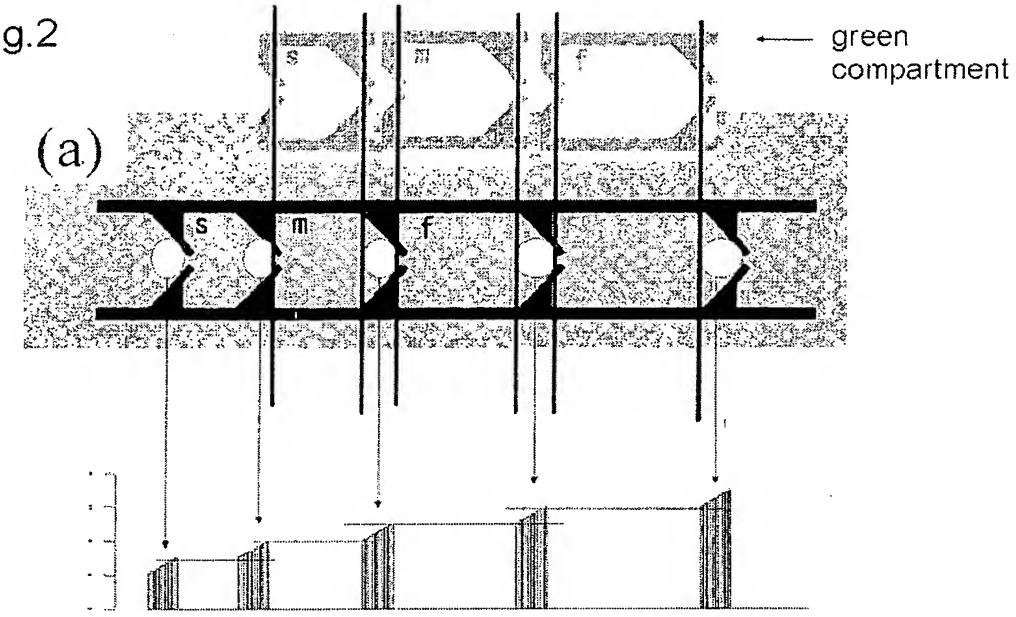
The mechanism in which the components can be desirably separated even when the forward moving period and the reverse

moving period are same will be explained. Here, both moving periods are set as "t". For example, when the moving speed of the sample is "r" and the sample is moved forwardly, a DNA fragment moves as far as (t x r). When the length of the compartment is equal to or larger than (t x r), the fragment can reach near the exit of the compartment but cannot go into the next compartment. However, when the length of the compartment is shorter than (t x r), the fragment can pass through the compartment separation mechanism (e.g. valve) and move into the next compartment. When, on the other hand, the samples are moved reversely, the fragments in each of the compartments go back to the entrance of respective compartment and are blocked by the valve and therefore remain in the original compartment.

Please note that the compartment separation mechanism need not be a "traditional" valve, but are preferably composed of a material not electrically affective to the components-to-be-separated in the sample. The check valves may typically be configured by a plurality of columnar structures arranged at intervals narrow enough to prevent the components-to-be-separated from passing therethrough. See, for example, page 4, line 14 to page 5, line 10 and Figure 1.

In exemplary Fig. 2(a), reproduced below, the green compartments express the downstream compartment of each of the black compartments.

Fig.2



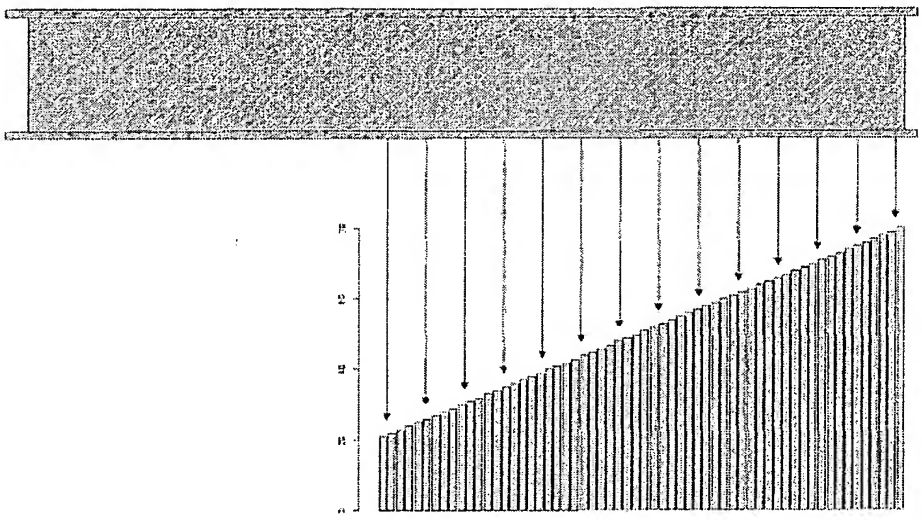
In this example, the length of the compartment become longer as it goes more downstream. In the compartment expressed as "m", which is longer than the compartment expressed as "s", DNA fragments which can move more than the length of the compartment "s" within time "t" and which cannot move more than the length of the compartment "m" within the time "t" are trapped.

By repeating the forward movement and the reverse movement, the fragments are separated into one of the compartment based on their moving speed characteristics. Thus, the distribution of the moving speed characteristics of the fragments becomes as shown in Fig. 2 (a).

Exemplary Fig. 2 (b), reproduced below, shows the distribution of the moving speed characteristics of the fragments

without the mechanism of the present invention. That is, a combination of CARLE and CHAN.

Fig.2
(b)



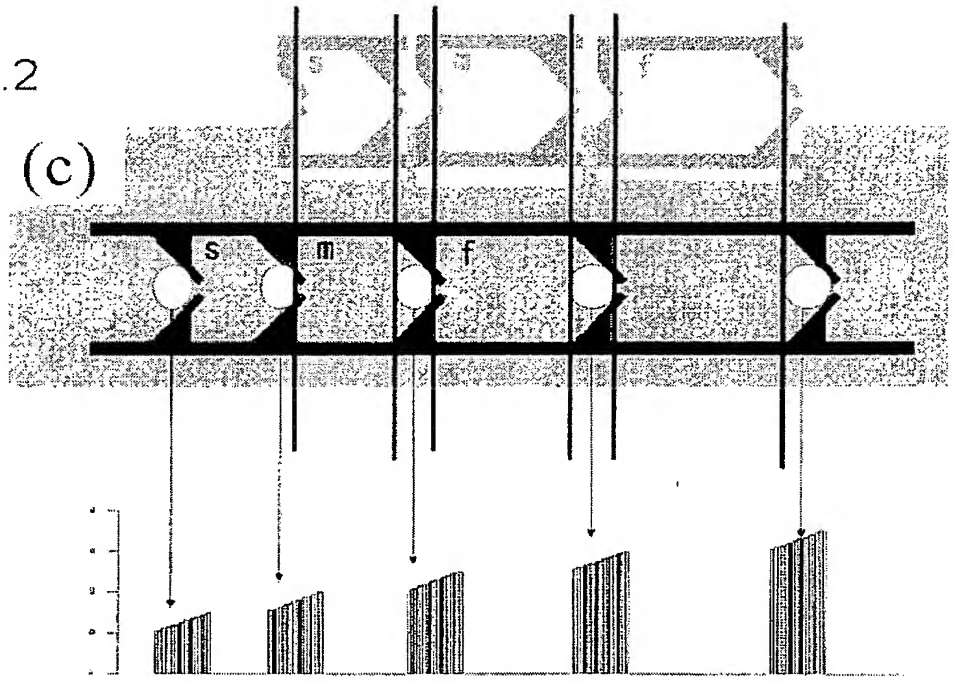
In CARLE, with respect to the Examples disclosed starting on column 10, line 36, the constant switching cycle is performed on 15-300 kb DNA for 3 seconds in a forward direction and 1 second in a reverse direction. Such movement results in a speed of about 0.05 mm/sec.

In contrast, according to the present invention, separation is performed by moving the sample in the channel through the compartments and requires an imposing period of more than 3 seconds. See for example, page 22, lines 20-27. In view of this, it is apparent that the "periodic inversion of the electric field" of CARLE is different from the recited force imposing pattern.

Thus, even if CARLE's technique and CHAN's technique are combined, the present invention cannot be obtained. According to CARLE's technique and Chan's technique, as shown in Fig. 2 (b), only the result same as that of conventional electrophoresis can be obtained.

Further, according to the present invention, even when the sample is added after the previous sample is already separated as shown in exemplary Fig. 2 (a), by repeating the above forward and reverse operation, the added sample can be separated the same as the previous separated sample as shown in exemplary Fig. 2 (c), reproduced below.

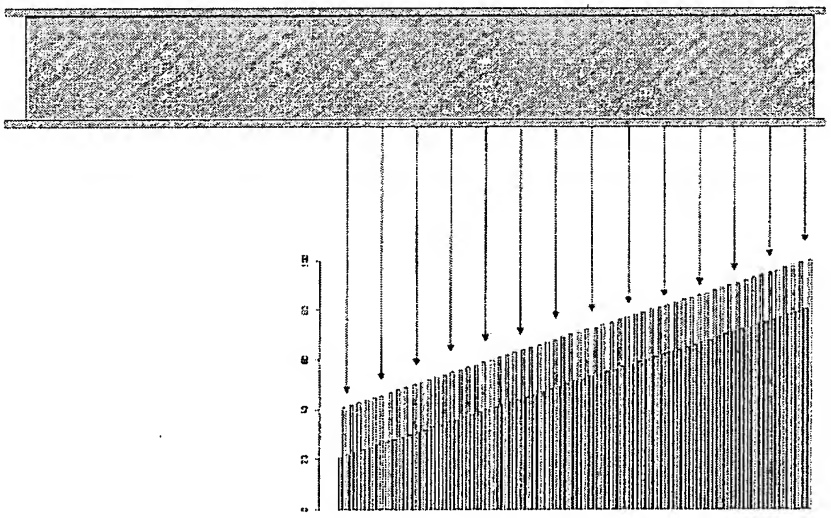
Fig.2



Here, the amount of the fragments included in each of the compartment is increased.

However, by the conventional techniques such as disclosed in CARLE or CHAN, while some sample (first sample) is being separate by performing a first electrophoresis and then another sample (second sample) is added in a sample introduction port, and the electrophoresis is continued, the first sample moves more downstream when the second sample moves. Thus, fragments having a rapid moving speed in the second sample overlaps the fragments having a slow moving speed in the first sample and the samples cannot be separated (as shown in exemplary Fig. 2 (d)), reproduced below.

Fig.2
(d)



This inability to separate later added samples is also a pronounced difference between the present invention and the references.

Arguments in Favor of the Patentability of

Claims 16, 30 and 31 in View of CARLE, CHAN and SHIMOIDE

The arguments against the combination of CARLE and CHAN are the same as set forth above with respect to claims 21, 22 and 24 and are not repeated.

However, additional arguments are presented based on the differences between independent claim 22 and independent claim 16.

With respect to SHIMOIDE, page 6, line 20 to page 7, line 2 of the Final Rejection states that SHIMOIDE et al. expressly recite a particular embodiment in which the sample is diverted from the main channel into the sub-channels, etc.

However, SHIMOIDE discloses independent embodiments and never mentions about imposing a first external force and a second external force having a different forcing direction from the first as recited in the present invention. In addition, although the examiner notes in page 7, line 19 to page 8, line 2 of the Final Rejection about reverse electrophoresis in SHIMOIDE, such general teaching is not sufficient to combine the references. Rather, factors such as the timing for imposing a reverse force are important. If the shape of the channel (length of the channel) and the imposing period are not appropriately controlled, only reverse movement of the sample occurs and the components cannot be separated properly.

Moreover, SHIMOIDE at column 25, lines 60+ teaches away from the present invention (separation of components) as follows. "Also, depending on channel structures, shapes of channel intended primarily for mixing and dilution of samples and reagents can include a shape in which one channel is merged with another channel and a shape in which a plurality of channels are merged with one channel at one point." SHIMOIDE is directed to mixing and diluting samples, not separating components and thus, not only fails to overcome the shortcomings of CARLE and CHAN, but also fails to provide motivation to make the proposed combination.

Arguments in Favor of the Patentability of Claims 1-4, 23-26, 38 and 39 in view of CARLE, CHAN, ANDERSON and PETHIG

The arguments against the combination of CARLE and CHAN are the same as set forth above with respect to claims 21, 22 and 24 and are not repeated.

Nevertheless, additional arguments are presented based on the differences between independent claim 22 and claim 1.

The Examiner argues that it would have been further obvious to modify the CARLE/CHAN device to include check valves in the compartments in order to prevent the components from leaking back.

However, as pointed out above (see the paragraph bridging pages 13 and 14), CARLE teaches away from any elements that have an influence on the migration of the molecules. Check valves would influence the migration of the molecules based not only on their physical presence, but also based on their purpose of prevent the components from moving back from a more forward direction, which CARLE requires for accurate separation into bands. See column 6, line 50 to column 7, line 7 of CARLE.

In addition, ANDERSON is related to separation of components of a fluid (paragraph [0011]), while CARLE is related to separating components in a gel. Based on the characteristics of the flow of fluids and that of gels, there is not motivation to combine the references in the first instance.

In any event, the addition of ANDERSON (PETHIG has a similar disclosure to that of ANDERSON) not only fails to overcome the shortcomings of CARLE and CHAN, but also further goes against the teachings of CARLE and therefore, fails to provide motivation to make the proposed combination.

Arguments in Favor of the Patentability of Claim 35 in view of CARLE, CHAN, ANDERSON, PETHIG and HANCOCK

Claim 35 depends from claim 1 and further defines the invention and is believed patentable at least for depending from an allowable independent claim.

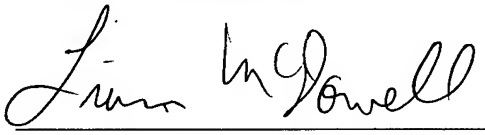
Conclusion

Appellant respectfully urges that the rejections on appeal should not be maintained, and respectfully requests that these rejections be reversed.

Please charge the fee of $510 for the Appeal Brief set forth in the attached Credit Card Payment Form.

Respectfully submitted,

YOUNG & THOMPSON



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August 12, 2008

8. Claims Appendix:

1. A separation apparatus comprising:

a channel through which a sample containing components-to-be-separated moves;

one, or two or more check valves disposed in said channel, suppressing back flow of said components-to-be-separated;

a plurality of compartments partitioned by said check valve(s); and

an external force imposing unit imposing external force to said components-to-be-separated so as to allow them to move through said channel,

wherein said external force imposing unit has a function of alternately executing a first external force imposing pattern by which the external force is imposed to said components-to-be-separated in the forward direction along said channel, and a second external force imposing pattern by which the external force is imposed to said components-to-be-separated in the direction opposite to the forward direction along said channel, to thereby fractionate said components-to-be-separated into any of said compartments.

2. The separation apparatus according to claim 1, wherein said channel is formed so as to extend in a straight form.

3. The separation apparatus according to claim 1, wherein said channel has one end where a sample introduction port is provided and the other end placed downstream of said one end,

said check valves are formed so as to block back flow of at least a part of said components-to-be-separated to an upstream side, and

said separation apparatus is structured such that when said first external force imposing pattern is imposed, a first portion of said components-to-be-separated is moved in the downstream compartment of one of the check valves and a second portion of said components-to-be-separated is remained in the upstream compartment of said one of the check valves, and when said second external force imposing pattern is subsequently imposed, said first portion is prevented from being moved back to said upstream compartment and said second portion moves toward said one end of said channel in said upstream compartment, to thereby fractionate said components-to-be-separated into any of said compartments by repeating imposing said first external force imposing pattern and said second external force imposing pattern.

4. The separation apparatus according to claim 1, wherein said external force imposing unit includes a plurality of electrodes provided to both ends of said channel, and has a function of executing said first external force imposing pattern

and said second external force imposing pattern by changing direction of voltage to be applied between said electrodes.

16. A separation apparatus comprising:

a channel having a main channel and sub channels formed as being branched out from said main channel, through which a sample including components-to-be-separated moves, said main channel having one end where a sample introduction port is provided and the other end placed downstream of said one end; and

an external force imposing unit imposing a plurality of external force imposing patterns having different imposing directions from each other to said components-to-be-separated so as to allow them to move through said channel,

wherein said external force imposing unit has a function of imposing a first external imposing pattern having a certain imposing direction from said one end to the other end of said main channel so that a portion of said components-to-be-separated is moved to the downstream of the connecting position of said main channel and one of said sub channels in said main channel and subsequently imposing a second external imposing pattern having a different imposing direction from said certain imposing direction so that at least a part of said portion of said components-to-be-separated moved to the downstream of said connecting position is moved into said one of said sub channels.

21. A separation method using a separation apparatus comprising a channel through which a sample containing components-to-be-separated moves, a plurality of compartments provided to said channel, and an external force imposing unit imposing external force to said components-to-be-separated so as to allow them to move through said channel,

wherein said external force is repetitively imposed sequentially in the direction departing from a sample introduction position and in the direction approaching the position on said channel, to thereby fractionate said components-to-be-separated into any of said compartments.

22. The separation method according to Claim 21, wherein said components-to-be-separated are fractionated into any of said compartments depending on migration ranges caused by imposition of said external force.

23. A separation method separating components in a sample using the separation apparatus described in claim 1, comprising:

a step of introducing said sample into said channel;

a first step of executing any one of said external force imposing patterns so as to move, within one compartment, said sample towards the downstream side of said channel;

a second step of executing any one of said external force imposing patterns so as to move, within one compartment, said sample towards the upstream side of said channel;

wherein these steps being sequentially repeated.

24. The separation method according to Claim 23, wherein duration of time of imposing the external force is kept constant for every execution, in said external force imposing pattern in said first step.

25. The separation method according to Claim 23, wherein duration of time of imposing the external force is kept constant for every execution, in said external force imposing pattern in said first step, and in said external force imposing pattern in said second step.

26. The separation method according to claim 23, wherein duration of time of imposing the external force in said external force imposing pattern in the second step is adjusted to substantially equal to, or longer than the duration of time of imposing the external force in said external force imposing pattern in the first step.

30. A separation method separating components in a sample using the separation apparatus described in claim 16, comprising:

a step of introducing said sample into said channel;

a first step of executing said first external imposing pattern so as to move said sample towards the downstream side of said channel so that a portion of said components-to-be-separated is moved to the downstream of the connecting position of said main channel and one of said sub channels in said main channel;

a second step of executing said second external imposing pattern so that at least a part of said portion of said components-to-be-separated moved to the downstream of said connecting position is moved into said one of said sub channels;

wherein these steps being sequentially repeated.

31. The separation method according to Claim 30, wherein in said external force imposing pattern in said first step, duration of time of imposing the external force is kept constant for every execution.

34. A system comprising an external force switching control unit executing the method described in claim 21.

35. A mass spectrometry system comprising:

a pre-treatment unit separating a biological sample depending on the molecular size or properties, and subjecting said sample to a pre-treatment for an enzyme digestion treatment;

a unit subjecting said sample pre-treated by said pre-treatment unit to the enzyme digestion treatment;

a drying unit drying the enzyme-digestion-treated sample; and

a mass spectrometry unit subjecting the dried sample to mass spectrometry, wherein said pre-treatment unit comprises a microchip described in claim 1.

38. The separation method according to Claim 21, wherein said separation apparatus further includes one, or two or more suppressing portions, each of said suppressing portions

being formed so as to block the back flow of at least a part of said components-to-be-separated to the upstream and partitioning said channel into an upstream compartment and a downstream compartment, and wherein said method comprising:

imposing a first external imposing pattern having a certain imposing direction from the upstream to one of said suppressing portions; and

after said imposing the first external imposing pattern, imposing a second external imposing pattern having a different imposing direction from said certain imposing direction such that the separation of a first portion of said components-to-be-separated which has passed said one of suppressing portions and a second portion of said components-to-be-separated which has not passed said one of suppressing portions is accelerated.

39. The separation method according to Claim 21, wherein said separation apparatus further includes one, or two or more suppressing portions, each of said suppressing portions being formed so as to block the forward flow of at least a part of said components-to-be-separated to the downstream and partitioning said channel into an upstream compartment and a downstream compartment, and wherein said method comprising:

imposing a first external imposing pattern having a certain imposing direction from the upstream to one of said suppressing portions; and

after said imposing the first external imposing pattern, imposing a second external imposing pattern having a different imposing direction from said certain imposing direction such that the separation of a first portion of said components-to-be-separated which has reached at said one of suppressing portions and a second portion of said components-to-be-separated which has not reached at said one of suppressing portions is accelerated.

9. Evidence Appendix

None.

10. Related Proceedings Appendix

None.